THE NATIONAL PLANT GERMPLASM SYSTEM

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PREFACE

This publication discusses the development and organization of the National Plant Germplasm System which forms a coordinated network of institutions, agencies, and research units (State, Federal, and private) working cooperatively to introduce, maintain, evaluate, catalog, and distribute plant germplasm. This national system is designed to meet the highly variable research needs of plant scientists in the United States, including minimizing genetic vulnerability of major crops.

This publication was prepared by the National Plant Germplasm Committee (NPGC), which serves as a spokesman for the System, advises on policy, and coordinates activities to meet the immediate and long term national goals of U.S. agriculture. Members of NPGC are:

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Lack of Native U.S. Farm Crops

Most of the plants from which the United States derives its food and fiber were introduced from other countries. Only a few crop plants are native. Some important native plants, in terms of economic worth to U.S. agriculture today, are sunflowers, cranberries, blueberries, strawberries, pecans, hops, range and forage grasses (excluding cereals), conifers, and hardwoods.

In precolonial and colonial times, early explorers and colonists who settled on Eastern shores were faced with the almost total lack of native food and fiber crops. Indians used many wild plants, but Indian corn (maize), beans, squash, and tobacco were the only crops found to be of much use.

With the exception of tobacco, all these crops were brought into the United States from Mexico hundreds of years ago by early Indian tribes. Corn was by far the most important food crop. Incoming colonists were cautioned to bring seeds of most crops with them. This form of plant introduction continued almost up to the present. One of the more notable

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Medal, issued for distinctive work in the field of plant introduction, commemorating the memory of Frank N. Meyer, agricultural explorer. Medal depicts the first recorded plant exploration—a search for the incense tree in 1500 B.C. during the reign of Egyptian Queen Hatshepsut.

late introductions was Grimm alfalfa, introduced in 1857 by a German immigrant of that name.

With such a dearth of native crop germplasm and a shallow base of primitive varieties, modern agriculture depends on a coordinated system to introduce, evaluate, and maintain the germplasm obtained elsewhere. Furthermore, research needs require an efficiently organized effort to assure that Federal, State, and local institutions, and commercial breeders get the germplasm they need. No single agency can be expected to provide the germplasm required by the array of breeders working with a given crop.

The Long History of Plant Introduction

The American Government early recognized the need for a continuing search for more adaptable crops. In 1819, American consuls overseas were urged to send useful plants back to the United States. From 1836 to 1862, the U.S. Patent Commissioner introduced new plants as a routine Government policy. With the establishment of the U.S. Department of Agriculture in 1862, plant exploration was accelerated, and by 1898 this activity was centered in the Section of Seed and Plant Introduction.

The essential elements of the present plant germplasm system developed gradually. The Research and Marketing Act of 1946 presented the opportunity for establishing regional and interregional plant introduction stations with funds and staff provided by both the Federal Government and the various States.

Collecting and Saving Desirable Genes

There are large gaps in the genetic diversity base of some crops, particularly the wild species and primitive varieties that may contain genes for disease and insect resistance and other desirable traits. Although found in many areas of the world, these sources of diversity are rapidly being depleted, displaced, or abandoned. Once lost, these sources will never again be available to mankind.

The nature of collecting and assembling genetic resources requires international collaboration. The preservation, evaluation, and distribution of this broad array of germplasm and the awareness of the needs of breeders for introduced germplasm rests with the National Plant Germplasm System of coordinated, cooperative Federal-State research programs.

The National Plant Germplasm System

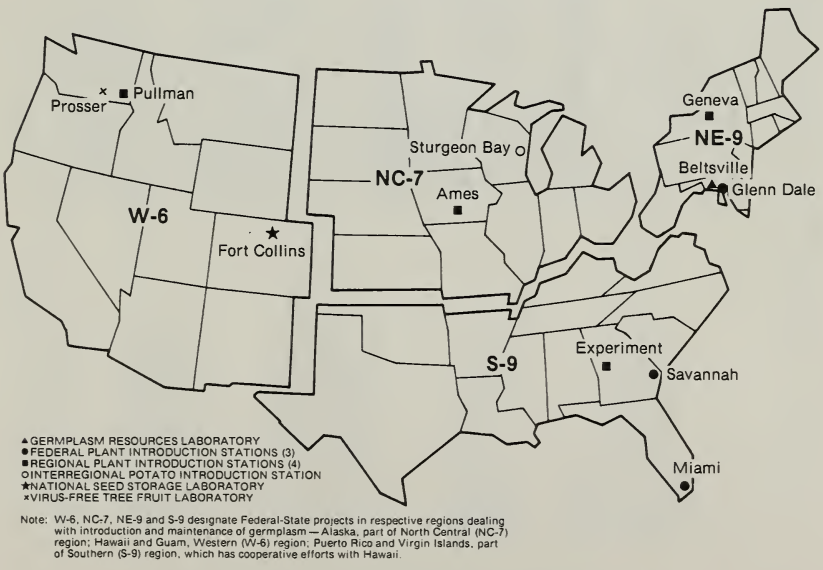
The National Plant Germplasm System (NPGS) is a coordinated network of institutions, agencies, and research units in the United States which work cooperatively to introduce, maintain, evaluate, catalog, and distribute all types of plant germplasm. Primary financial and adminis-

trative support for the components of the System comes from the Science and Education Administration (SEA) of the U.S. Department of Agriculture and from the State agricultural experiment stations (SAES). Commercial breeding and seed trade interests also contribute to and support the System.

The key elements of NPGS are: (1) The SEA Germplasm Resources Laboratory at Beltsville, Md.; (2) three SEA Plant Introduction Stations at Glenn Dale, Md.; Savannah, Ga.; and Miami, Fla.; (3) four State-Federal regional plant introduction stations located at Pullman, Wash.; Ames, Iowa; Geneva, N.Y.; and Experiment, Ga.; (4) the State-Federal Potato Introduction Station at Sturgeon Bay, Wis.; (5) the SEA National Seed Storage Laboratory at Ft. Collins, Colo.; and (6) a large group of Federal and State and private plant germplasm curators located throughout the United States. (Major curators of collections are identified by location and regional project number in the chart on p. 9.)

The Mayaguez Institute for Tropical Agriculture at Mayaguez, P.R., also has responsibility for maintaining some tropical germplasm. In addition, limited germplasm resources are maintained and continuously evaluated by the Interregional Virus-Free Deciduous Tree Fruit Laboratory at Prosser, Wash., and by regional project cooperators in the 50 States, Puerto Rico, Guam, and the Virgin Islands.

The location of the major stations for the National Plant Germplasm System are shown in the chart below and discussed in greater detail in table 1. The relationship of these cooperating agencies is shown in the chart on page 9.



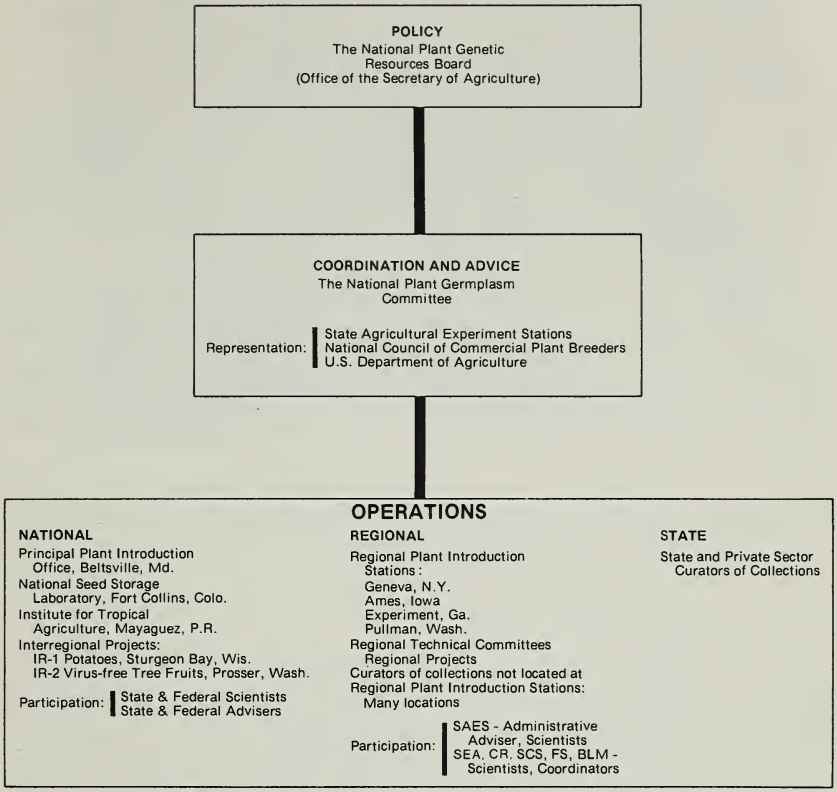
Major stations of the National Plant Germplasm System.

TABLE 1.—National Plant Germplasm System: Principal stations or laboratories responsible for introduction, maintenance, and distribution of plant germplasm

Station or laboratory	Name and address	Major collections of regional responsibilities	Remarks
National Seed Storage Laboratory	Dr. Louis N. Bass National Seed Storage Lab. Fort Collins, Colo. 80521	Gene bank collections of seed crops and their wild relatives	Long-term storage
Germplasm Resources Laboratory	Dr. George A. White Plant Genetics & Germplasm Institute BARC-West Beltsville, Md. 20705	World collections of wheat, oat, barley, and rye (Dr. J.C. Craddock) and rice (Dr. A. J. Oakes)	National focal point for introduction, documentation, initial distribution, and exchange of plant germplasm. Quarantine & detention nursery; coordination of cereal rust program.
Northeastern Regional Plant Introduction Station	Dr. Desmond D. Dolan N.Y. State Agric. Expt. Sta. Regional Plant Intro. Station Geneva, N.Y. 14456	Perennial clover, onion, pea, spinach, broccoli, timothy	Operating through Regional Research Project, NE-9, 12 States, SEA, FS, & SCS participating.
Southern Regional Plant Introduction Station	Dr. W.R. Langford Regional Plant Intro. Sta. Experiment, Ga. 30212	Cantaloup, cowpea, millet, peanut, sorghum, pepper	Operating through Regional Research Projects S-9, 14 States, SEA & SCS participating.
North Central Regional Plant Introduction Station	Dr. Willis H. Skrdla Regional Plant Intro. Sta. Iowa State University Ames, Iowa 50010	Alfalfa, corn, sweet clover, beets, tomato, cucumber	Operating through Regional Research Project, NC-7, 13 States, SEA & SCS participating.
Western Regional Plant Introduction Station	Dr. S.M. Dietz Regional Plant Intro. Sta. Room 59, Johnson Hall Washington State University Pullman, Wash. 99163	Bean, cabbage, fescue, wheat grasses, lentils, lettuce, safflower	Operating through Regional Research Project W-6, 12 States, SEA, SCS, FS, & BLM participating.
Interregional Potato Introduction Laboratory	Robert E. Hanneman, Jr. Interregional Potato Introduction Station Sturgeon Bay, Wis. 54235	*Solanum tuberosum* and *Solanum* spp.	Operating through Interregional Project 1, SAES & SEA in four regions participating.
ARS Plant Introduction Station	Dr. Howard E. Waterworth Plant Quarantine Facility P.O. Box 88 Glenn Dale, Md. 20769	Pome and stone fruits and woody ornamentals	Distributes certified pestfree introductions consisting of prohibited and postentry quarantine categories of fruits, woody ornamentals, and certain vegetables.
ARS Plant Introduction Station	Dr. W.C. Adamson U.S. Plant Introduction Sta. Route 4, Box 433 Savannah, Ga. 31405	Cold, hardy bamboo species	Research on kenaf, Chinese waterchestnuts, and miscellaneous ornamentals.

TABLE 1.—National Plant Germplasm System—*Continued*

Station or laboratory	Name and Address	Examples of major collections of regional responsibilities	Remarks
SEA Plant Introduction Station	Subtropical Horticultural Research Station 13601 Old Cutler Road Miami, Fla. 33158	Tropical and subtropical species including 287 accessions of coffee, 152 mangoes, 160 cacao	Research on mango, avacado, and other tropical fruits.
Interregional Virus-Free Deciduous Tree Fruit Lab.	Dr. Paul R. Fridlund Irrigated Agricultural Res. and Extension Center Prosser, Wash. 99350	Virus-free cultivars of pome and stone fruits	Operating through Interregional Project 2, SAES & SEA in four regions participating.



The National Plant Germplasm System structure.

Coordination of the research and service functions of these elements is achieved on the State, regional, and national level. Each agricultural experiment station and participating Federal agency is represented directly or indirectly on technical committees related to regional or interregional stations. Scientists who serve as technical committee members on these projects not only collaborate in the evaluation of plant introductions but also formally represent the National Plant Germplasm System and provide liaison among other scientists at their respective locations.

Some of the representatives of each technical committee are members of the SEA Plant Germplasm Coordinating Committee, which is internally advisory to SEA. Several representatives of each technical committee are also members of the National Plant Germplasm Committee (NPGC). The NPGC also includes representation from the National Council of Commercial Plant Breeders and Cooperative Research.

These cooperative units, which comprise the National Plant Germplasm System, have a general mission of providing plant scientists with the germplasm needed to carry out their research. The research programs sup-

ported in this way vary widely and include the breeding of new varieties for such purposes as resistance to diseases, insects, smog injury, temperature, moisture, salinity, and other environmental stresses; for increased yield and quality; for ease of harvesting, better processing, and longer storage; for beautification, noise abatement, erosion control, and resistance to fire; and as sources of anticancer medicinals, analgesics, and industrial chemicals. The well-coordinated operation of the System is evidenced by the reasonably good status of present plant genetic resources propagated by seed.

Introduction of plant materials is accomplished by planned foreign and domestic explorations, exchange with foreign scientists and agencies, and contributions from traveling scientists. To set up an exploration, breeders, scientists, or commodity groups send proposals through the State-Federal regional project structure (see chart, p. 9) for review and possible funding by SEA.

The Germplasm Resources Laboratory provides a national focal point and clearing house for exchange of plant germplasm with foreign countries. This laboratory also catalogs all incoming accessions, assigns plant introduction (P.I.) numbers, makes taxonomic identification, and distributes P.I. material to maintenance centers or other curators according to established regional crop priorities.

Selected germplasm is also entered into the National Plant Germplasm System from domestic research programs. This germplasm includes induced and natural mutations; cytological stocks such as monosomes, trisomes, and translocations; marker genes; species hybrids, breeding material with valuable combinations of characters; pest resistant stocks; and obsolete commercial varieties that may have genes useful in the future. Research personnel who develop such material are obligated to call it to the attention of the appropriate regional coordinator or crop curator for inclusion in the Maintenance System.

Maintenance is the responsibility of Regional and Interregional Plant Introduction Stations, curators of collections for specific crops, and the National Seed Storage Laboratory. Curators are individual research scientists with special long-term interests in particular kinds of plant germplasm who agree to maintain plant germplasm in cooperation with regional and interregional stations.

The National Seed Storage Laboratory is concerned with the long-term storage of seed. The regional and interregional stations and the germplasm curators must continually replenish plant germplasm by regrowing accessions in the field and greenhouse. The curators must also preserve viable seed stocks for distribution.

Evaluation of plant genetic resources is basically accomplished in two ways: (1) Plant introductions are screened initially for a wide range of desirable characteristics, including their resistance to predominant diseases and insects affecting commercial crops to which they are related; and (2) plant introductions are extensively evaluated in the field, greenhouse, and laboratory by cooperating State, Federal, and private plant

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Rows of clover at regional plant introduction station at Experiment, Ga., where seeds are tested and evaluated.

scientists for widely varying traits needed in their research. Results are reported to the maintenance centers.

Distribution of plant germplasm is made to all responsible scientists, agencies, and institutions requesting it. All Federal and State-Federal stations which maintain working collections distribute, free of charge, sufficient quantities of plant material to start their research.

The National Seed Storage Laboratory distributes stocks only when material is not available from working collections. Persons who receive plant materials are responsible for acknowledging in publications the source of any material used in their research and for reporting to the supplying agency the performance of all materials tested.

Table 2 shows the approximate number of accessions of introduced plants held by the various stations or laboratories and the samples distributed from 1973 through 1975.

The National Plant Germplasm System is well established and is functioning to fulfill the germplasm needs for minimizing the genetic vulnerability of major crops. An advisory group to the System, the National Plant Germplasm Committee, continually reviews and makes funding recommendations on needs and goals. Recommendations are in keeping with goals suggested by other national advisory bodies.

The Committee coordinates System activities and advises administrators of the U.S. Department of Agriculture and State agricultural experiment stations. The Committee has identified the following high priority areas:

1. Establishing repositories for clonally-propagated plants such as pome fruits, stone fruits, small fruits, grapes, citrus, nut crops, and subtropical fruits.

2. Providing for capital improvements, additional staff, and support funds for National, regional, and interregional stations and laboratories for the continuing introduction, quarantine, maintenance, distribution, and evaluation of plant genetic resources, including the establishment and funding of a tropical facility with primary responsibility to increase and maintain plant genetic resources.

3. Funding selected plant germplasm curators throughout the United States.

4. Identifying the gaps that exist in major collections and greatly increasing funds for plant explorations designed to fill these gaps.

5. Computerizing, in uniform terms, all plant genetic resource holdings in the United States.

6. Consolidating plant genetic resource holdings for safer maintenance at least cost and enhancing wider availability to users.

7. Expanding preliminary evaluation of plant germplasm.

Table 2.—Number of plant introductions held and samples distributed by fiscal year (FY) by the various units within the National Plant Germplasm System

Station or laboratory	Total plant introductions held	Samples distributed		
		1973	1974	1975
National Seed Storage Laboratory	90,233	730	792	730
Germplasm Resources Laboratory (small grains collections)	71,870	143,300	128,896	117,495
Northeastern Regional Plant Introduction Station	20,000	10,500	5,000	8,998
Southern Regional Plant Introduction Station	28,000	9,000	8,532	11,981
North Central Regional Plant Introduction Station	20,000	10,000	6,855	11,500
Western Regional Plant Introduction Station	28,000	17,000	12,000	28,448
Interregional Potato Introduction Station	4,000	2,570	2,908	3,400
SEA Plant Introduction Station (Glenn Dale, Md)	9,000	2,250	2,500	2,775
SEA Plant Introduction Station (Savannah, Ga)	397	50	40	50
SEA Plant Introduction Station (Miami, Fla)	4,164	601	1,711	1,366
Interregional Virus-Free Deciduous Tree Fruit Laboratory	460	[1]14,125 [2]476	[1]22,520 [2]878	— — — — — —

[1]Buds.

[2]Cultivars.

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